#556

ISEE 1

PLASMASPHERIC ELEC. FLD. 3 SEC. AVG

77-102A-11D

ISEE 1

3-S AVGD PLASMASPHERIC ELEC. FIELD

77-102A-11D

THIS DATA SET HAS BEEN RESTORED. THERE WAS ORIGINALLY ONE 9-TRACK, 1600 BPI TAPE WRITTEN IN EBCDIC. THERE IS ONE RESTORED TAPE WRITTEN IN ASCII. THE DR TAPE IS A 3480 CARTRIDGE AND THE DS TAPE IS 9-TRACK, 6250 BPI. THE TIME SPAN IS NOT CONTAINED ON THE TAPE AND CAN NOT BE VERIFIED. THE ORIGINAL TAPE WAS CREATED ON AN IBM 360 COMPUTER AND WAS RESTORED ON AN IBM 9021 COMPUTER. THE DR AND DS NUMBER ALONG WITH THE CORRESPONDING D NUMBER AND TIME SPAN IS AS FOLLOWS:

DR#	DS#	D#	FILES	TIME SPAN
DR005346	DS005346	D053321	160	12/02/77 - 11/30/78

REQ. AGENT	REQ. NO.	ACQ. AGENT
DEW	V0160	HKH

ISEE 1
PLASMASPHERIC ELEC. FLD. 3 SEC. AVG
77-102A-11D

This data set catalog consists of 1 data tape. The tape is 1600, bpi, 9 track, EBCDIC, with 160 files of data. The time span is not on the tape. The D and C numbers are as follows:

D#	C#	TIME SPAN	FILES
D-53321	C-22722	12/2/77 - 11/30/78	160

September 15, 1982

TO: 601/NSSDC/Kent Hills

FROM: 696/Computer Sciences Corporation

SUBJECT: 9 Track 1600 bpi Tape of the ISEE-1

Attached is a 9 track 1600 bpi tape of the ISEE-1 culled data sets for a 12 month period beginning in December 1977. In addition, there is a chronological listing of the files noting the start and finish times and whether the satellite was in-bound or out-bound. There are 166 files on the tape and the following is a list of their characteristics:

The recordlength is 55 bytes (the 55th byte is a control character) and the block size is 2750 bytes.

Format (3I2, 6F8.3, 1x)

	TIME								
	HH	MM	SS	L	MLT	E_n	E_E	E_R	E_A
Byte#	1,2	3,4	5,6	7..14	15..22	23..30	31..38	39..46	47..54

where E_r and E_a are the electric field components in the equatorial plane and E_n and E_E are their ionospheric projections. A data description is attached.

Please contact me if you have any questions.

Cathie Meetre

Cathie Meetre (344-5403)

Attachments: 2

September 14, 1982

TO: 601/NSSDC/Kent Hills

FROM: 696/Electrodynamics Branch

SUBJECT: ISEE-1 Electric Field Data

Attached is (1) a data tape, (2) tape format, (3) listing of files and (4) a brief description of how the data was handled for ISEE-1 Electric Field data from the HPM instrument. The tape covers from December 1, 1977 to December 1, 1978 and includes all usuable data in the plasmasphere (mostly inside L of 6). The listing of files gives each UT time span. We would like to submit this data to the NSSDC ISEE files. For more information contact N. C. Maynard.

J. P. Heppner

James P. Heppner

Attachments: 4

HPM PLASMAPHERIC ELECTRIC FIELDS

The Electric Field Data

Electric field measurements were made from the ISEE-1 spacecraft using the double probe technique with long cylindrical sensors (Heppner et al., 1978). The baseline (separation between the midpoints of the sensors) of the double probe system of long wires was 179 m. From this single axis, measurements of both components of the electric field in the spin plane were possible every spin period (3.05s). Data along the instantaneous direction of the axis were taken 16 or 32 times per second depending on the data rate. The spin plane was approximately coincident with the solar ecliptic XY plane in this 23.2 Re apogee orbit.

In all data presented here the $\underline{v}_s \times \underline{B}$ electric field from the satellite velocity $\underline{v}_s$ and the corotation electric field have been vectorially subtracted. Thus the measurements are transferred to a coordinate system corotating with an observer on the Earth. The magnetic field used in the $\underline{v}_s \times \underline{B}$ calculations was that measured on board the spacecraft (Russell, 1978).

To determine the electric field in the spin plane, data taken when either antenna was within 20° of the sun was culled in order to remove any errors caused by shadowing of a sensor or by reduced photoemission from a small sun angle, and the remaining data was fitted to a sine wave using a least squares technique. The solar ecliptic X and Y electric field components in inertial space were then determined from the sine wave fit, and the $\underline{v}_s \times \underline{B}$ and corotation subtractions were done to yield the electric field in the earth fixed coordinate system.

The third component of the electric field (solar ecliptic E_z) was calculated assuming that $\underline{E} \cdot \underline{B} = 0$. This extrapolition is good providing that the ratio of $\underline{B}_{xy}$ to $\underline{B}_z$ is low. The resulting vector electric field was then transformed into the radially outward and azimuthally eastward

components perpendicular to $\underline{B}$. For the plasmasphere studies these electric fields were then projected to the magnetic equatorial plane and to the ionosphere assuming that the magnetic field lines are equipotentials and that the magnetic field was a dipole. The projections were done on each data set to provide a common reference for comparison of data taken at different magnetic latitudes. When projected to the northern hemisphere ionosphere these components become the northward and eastward electric fields respectively. Note that the projection introduces errors from our inprecise knowledge of the magnetic field configuration. The original L values were calculated using the GSFC harmonic analyses of B with the Mead-Fairfield tail extension. We in turn have projected the values to the ionosphere assuming a symmetric dipole. Thus especially at the higher L values, both the projection factor and location will have some error. This was not considered to be critical to the results presented here.

The purpose of this study was to find the average electric field seen in the plasmasphere. Thus it was mandatory to remove any bad data that could affect the results. All data were scanned, and regions where the instrument was in its internal calibration cycle as well as regions where the Harvey instrument (Harvey et al., 1978) was transmitting (causing the electric field sensors to be shorted) were culled from the data set.

In regions of low density plasma ($< 1/cm^3$) the electric field instrument sees an apparent sunward directed electric field that is caused by the asymmetries of the sheath of photoelectrons around the spacecraft. The effect results from two causes. The dipole of the negatively charged sheath on the sunward side of the spacecraft and the positively charged spacecraft is one cause, and the other is the asymmetric collection by the sunward sensor of photoelectrons from the spacecraft, (see Cauffman and Maynard, 1975). It is hard to pinpoint exactly at what density this effect becomes significant (it is also a function of the temperature of the medium as well). As the plasma becomes more rarified, the first sign of asymmetrical photoelectron emission errors appears in data taken with the sensor axis within $\pm 20^{\circ}$ from the sun or at a near grazing angle (data which is not used in the least squares calculation to determine the electric field). In order to scrupulously avoid any data that might be the least

bit contaminated by this effect, all data were culled that had large bite outs where the antenna axis was directed toward the sun or that had a significant solar ecliptic E_x. This last criteria eliminated some good data where the convective electric field would be expected to be in that direction. A comparison of the point where culling started and plots of electron density from the Harvey instrument for several orbits (M. Echeto, private communication, 1980) showed that the data that were kept were in general from regions of electron densities greater than 30 to 50/cm^3.

The ISEE-1 electric field data from 1 December 1977 to 1 December 1978 were scanned and culled with the above criteria to form the data base for this study. A second culling of the data base was done to remove data when the ratio of Bz to $|B|$ was 0.2 or less in order to prevent errors from the $\underline{E} \cdot \underline{B}$ extrapolation from seriously effecting the results.

ISEE-1 Culled data sets

in chronological order

December 1977 – November 1978

Prepared by C. Meetre, C.S.C.
July 1982

December 77

Date	Start time			Stop time			Tape File #	I	O	N	Disc #
EC 2, 77	4	54	50	5	30	0	1	✓			14
EC 4, 77	13	45	02	14	56	26	2	✓			14
EC 4, 77	15	58	25	16	29	55	3		✓		14
EC 6, 77	23	0	1	23	59	55	4	✓			14
EC 7, 77	0	0	7	0	19	44	5	✓			14
EC 7, 77	1	24	26	2	04	55	6		✓		14
EC 9, 77	10	48	35	11	08	38	7		✓		14
EC 9, 77	7	40	1	9	9	16	8	✓			14
EC 11, 77	18	12	06	19	09	59	9	✓			14
EC 14, 77	3	42	40	4	24	59	10	✓			14
EC 14, 77	5	32	12	5	37	49	11		✓		14
EC 16, 77	14	55	28	15	30	59	12		✓		1
EC 16, 77	11	38	36	13	34	57	13	✓			1
EC 18, 77	21	48	06	23	09	10	14	✓			1
ec 19, 77	0	24	06	0	54	58	15		✓		1
EC 21, 77	9	44	44	9	57	53	16		✓		1
ec 21, 77	7	40	06	8	14	59	17	✓			1
ec 23, 77	19	13	07	19	33	06	18		✓		1
ec 23, 77	16	04	07	17	59	03	19	✓			1
ec 26, 77	2	13	7	3	13	9	20	✓			2
ec 28, 77	13	52	03	14	19	55	21		✓		1
ec 28, 77	10	41	7	12	40	55	22	✓			1
ec 30, 77	20	22	06	21	51	50	23	✓			2
ec 39 77	23	14	38	23	29	58	24		✓		2

mislabeled on disc as DEC1278IC

Date	Start time Hr	Min	Sec	Stop time Hr	Min	Sec	Tape file #	I	O	N	Disc #
Jan 2, 1978	6	32	00	6	59	59	25	✓			2
Jan 2	8	40	43	8	46	35	26		✓		2
Jan 4	18	8	16	18	18	8	27		✓		2
Jan 4	16	19	02	16	43	55	28	✓			2
Jan 9	12	52	11	12	59	58	29		✓		2
Jan 9	10	22	26	11	28	42	30	✓			2
Jan 11	19	38	01	20	49	58	31	✓			2
Jan 11	22	12	14	22	18	58	32		✓		2
Jan 14	4	57	41	5	15	53	33	✓			2
Jan 16	13	20	03	15	24	59	34	✓			2
Jan 18	23	49	0	23	59	51	35	✓			2
Jan 19	0	0	9	0	46	39	36	✓			2
Jan 21	10	59	18	12	1	52	38	✓			3
Jan 21	8	15	1	10	7	59	37		✓		3
Jan 23	21	29	50	21	37	26	39		✓		3
Jan 23	17	15	02	19	19	09	40	✓			3
Jan 26	5	39	08	5	52	07	41		✓		3
Jan 28	15	4	2	15	59	58	42		✓		3
Jan 28	12	38	02	14	20	0	43	✓			3
Jan 30	22	55	1	23	13	14	44	✓			3
Jan 31	20	27	1	0	53	54	45		✓		3

Date	Start time			Stop time			Tape file #	In	Out	N	Disc #
	HR	Min	Sec	HR	MIN	SEC					
Feb 02, 1978	9	50	08	10	39	59	46		✓		15
Feb 02	18	5	1	9	6	22	59	✓			4
Feb 04	19	9	7	19	59	55	47		✓		15
Feb 07	DID		NOT	COPY			[illegible]		✓		16
Feb 09	12	26	2	12	54	58	48	✓			4
Feb 11	21	25	1	22	29	58	49	✓			4
Feb 14	6	28	44	7	54	59		✓		* not copied	4
Feb 14	8	40	8	9	27	48	50		✓		16
Feb 16	18	7	40	18	42	57	51		✓		16
Feb 16	16	43	10	17	19	59	52	✓			4
Feb 19	3	23	8	3	44	57	53		✓		16
Feb 21	12	44	7	13	34	58	54		✓		16
Feb 21	10	49	33	12	4	54	55	✓			4
Feb 23	22	7	16	22	44	57	56		✓		16
Feb 23	DID		NOT	COPY				✓			4
Feb 26	7	32	8	8	9	58	57		✓		16
Feb 26	5	30	1	6	45	0	58	✓			3
								✓			4
Feb 28	15	38	2	16	15	0	60	✓			3
Feb 28	16	57	6	17	34	59	61		✓		16

Date March '78	Start time HR	MIN	SEC	HR	MIN	SEC	Tape file #	In	Out	N	Disc #
3	2	17	7	2	37	56	62		✓		10
5	9	39	6	10	59	59	63	✓			10
5	11	39	48	12	19	0	64		✓		10
7	19	40	7	20	14	58	65	✓			10
10	4	30	8	5	38	18	66	✓			10
10	6	26	8	6	59	58	67		✓		10
12	13	53	7	15	7	58	68	✓			17
12	15	49	7	16	39	58	69		✓		17
15	0	10	8	2	45	9	70	✓			17
17	10	34	7	11	18	26	71		✓		17
17	9	8	8	9	54	59	72	✓			17
29	7	42	7	8	46	57		✓			5
29	9	48	7	10	6	58	73		✓		14
31	18	46	6	19	9	58	74 ?		✓		14

April '78

Date	Start Hr	Start Min	Start Sec	Stop Hr	Stop Min	Stop Sec	Tape file #	In	Out	N	Disc #
April '78											
3	2	48	7	3	16	54	75 ?	✓			14
3	4	7	7	4	42	26	76 ✓		✓		14
5	12	6	24	12	49	58	77	✓			14
7	22	52	7	23	16	57	78		✓		8
10	8	17	7	9	25	0	79	✓			8
10	5	42	8	7	37	59	80		✓		8
12	17	36	7	18	7	10	81 ?	✓			8
12	16	4	6	16	54	57	82 ?	✓			9
15	1	56	33	2	8	33	83			✓	9
17	12	48	40	13	11	9	84	✓			9
17	10	45	8	11	40	0	85	✓			9
24	15	15	2	15	44	58	86			✓	9
24	16	44	7	16	51	58	87			✓	9
27	1	47	6	2	14	58	88		✓		9
27	0	39	6	0	49	53	89		✓		
29	9	27	52	10	29	59	90				

May '78

Date May 78	Start			Stop			Tapefile #	In	Out	N	
8	23	DEC	46	23	29	17	ON91	✓			8
11	8	22	8	9	12	20	92	✓			8
13	TRY	THIS	AGAIN						✓		4
16	3	24	14	3	53	52	93			✓	9
16	14	35	7	5	32	59	94		✓		9
18	13	3	7	13	10	0	95			✓	9
23	8	0	25	8	8	1	96	✓			9
23	8	56	9	9	19	43	97		✓		9
28	2	30	7	2	42	50	98			✓	9
28	1	5	7	1	22	32	99	✓			9
28	3	22	7	4	16	36	100		✓		9

June '78

Date June '78	Start			Stop			Tape file #	In	Out	N		
1	22	25	25	22	34	58	101		✓			12
1	20	0	6	20	18	46	102	✓				12
4	5	32	8	25	49	58	103	✓				12
4	7	36	9	8	18	6	104		✓			12
9	2	6	9	2	39	57	105		✓			12
11	11	25	8	12	24	59	106		✓			10
11	9	43	27	9	53	8	107	✓				10
13	20	52	6	20	57	29	108		✓			10
16	5	28	39	5	34	59	109			✓		10
20	22	41	4	23	25	0	110	✓				10
21	0	57	9	1	42	43	111		✓			10
23	8	31	8	8	51	58	112	✓				10
23	9	30	40	9	36	48	113			✓		10
23	10	9	8	10	39	45	114		✓			10
28	3	4	9	3	37	18	115	✓				10

July 78

Date July 78	Start			Stop			Tape file #	I	O	N	Disc #
2	22	4	36	22	23	55	116	✓			16
2	23	34	7	23	59	58	117		✓		16
3	20	0	19	0	10	0	118		✓		16
5	9	2	15	9	29	58	119		✓		16
10	1	36	17	2	28	32	120	✓			16
12	10	56	18	11	53	24	121	✓			16
14	21	0	6	21	19	59	122	✓			11
17	5	0	7	5	10	28	123	✓			15
17	8	32	16	8	53	52	124		✓		11
19	15	20	9	15	53	52	125	✓			11
22	0	40	9	1	21	26	126	✓			11
22	2	16	6	3	29	27	127		✓		11
24	9	54	7	10	43	56	128	✓			11
26	19	0	6	19	14	58	129	✓			11
26	20	58	0	21	45	0	130		✓		11
29	7	8	9	7	39	57	131		✓		11
29	4	25	2	5	29	57	132	✓			11

Date Aug '78	Start		Stop				Tape file #	I	O	N	Disc#
3	1	21	6	2	8	19	133		✓		15
~~X~~							~~—~~				
5							~~—~~		✓	←	15
10	5	6	7	6	4	58	134		✓		15
10	3	15	1	4	20	0	135	✓			15
14	23	47	9	23	54	58	136		✓		15
15	0	11	18	0	24	59	137		✓		15
17	7	8	8	7	34	58	138	✓			15
~~XX~~							~~—~~	✓			15
19	18	37	08	18	36	37	139		✓		15
22	3	51	31	4	9	59	140		✓		15
22	1	4	8	3	9	59	1141	✓			15

September '78

Date SEP '78	Start			Stop			Tape file #	I	O	N	Disc #
3	0	51	7	1	34	59	142	✓			12
12	16	5	8	16	9	57	143		✓		12
14	23	30	1	23	59	57	144	✓			12
15	0	0	9	0	45	0	145	✓			12
15	1	40	36	1	59	55	146		✓		12
19	17	55	2	19	24	46	147	✓			12
22	3	35	8	4	19	58	148	✓			12
26	22	29	6	23	40	0	149	✓			12

October '78

Date OCT '78	Start			Stop			Tape file #	I	O	N	Disc #
1	16	56	7	18	13	20	150	✓			17
8	20	54	6	22	29	57	151	✓			17
11	8	35	2	8	36	58	152		✓		17
13	16	14	9	17	4	9	153	✓			17

```
$NOP
$NOP ********** DO-1 **********
$EXEC TPLIST BS

INPUT PARAMETERS ARE:  ED SR=1=1 1

 TAPE NO.   1              FILE NO.   1
 RECORD   1                LENGTH   2750
  45450   4.211  11.996  -1.615  -6.426  -0.103  -0.744  45453   4.209  11.998  -1.175  -8.526  -0.0
75  -0.987  45456   4.208  11.999  -0.357  -8.769  -0.023  -1.016  45459   4.206  12.001  -0.929  -
7.372  -0.059  -0.855  455 2   4.204  12.002  -1.516  -7.053  -0.097  -0.818  455 5   4.202  12.003
  -2.365  -8.592  -0.151  -0.997  455 8   4.201  12.005  -4.494  -9.362  -0.288  -1.087  45511   4.
199  12.006  -5.633  -7.372  -0.361  -0.857  45514   4.197  12.008  -5.523  -7.797  -0.354  -0.907
 45517   4.196  12.009  -5.427  -8.940  -0.346  -1.040  45520   4.194  12.010  -6.145  -9.902  -0.3
95  -1.153  45523   4.192  12.012  -6.272 -10.529  -0.403  -1.227  45526   4.190  12.013  -3.707 -1
0.622  -1.239  -1.238  45529   4.189  12.015  -1.719  -9.983  -0.111  -1.164  45532   4.187  12.016
  -2.693  -6.390  -0.173  -0.735  45535   4.185  12.017  -3.280  -6.554  -0.211  -0.766  45538   4.
183  12.019  -5.230  -5.326  -0.337  -0.623  45541   4.182  12.020  -6.425  -1.579  -0.415  -0.185
 45544   4.180  12.022  -5.792   0.457  -0.374   0.053  45547   4.178  12.023  -6.723   0.142  -0.4
35  -0.017  45550   4.176  12.024  -8.317   0.919  -0.536   0.108  45554   4.175  12.026  -5.659
0.524  -0.366   0.061  45557   4.173  12.027  -2.716  -2.289  -0.176  -0.269  456 0   4.171  12.029
  -3.617  -1.328  -0.234  -0.156  456 3   4.170  12.030  -1.448   2.112  -0.094   0.248  456 6   4.
168  12.031  -0.537   5.952  -0.035   0.699  456 9   4.166  12.033   1.782   6.197   0.116   0.729
 45612   4.164  12.034   2.482   6.370   0.161   0.750  45615   4.163  12.036   2.340   9.257   0.1
52   1.090  45618   4.161  12.037   1.096   9.866   0.071   1.162  45621   4.159  12.039   3.199   1
0.745   0.208   1.267  45624   4.157  12.040  -4.262   7.210  -0.278   0.851  45627   4.156  12.041
  -8.157   6.888  -1.525   0.813  45630   4.154  12.043  -8.007   8.214  -0.522   0.970  45633   4.
152  12.044 -12.121   8.538  -0.791   1.099  45636   4.151  12.046 -12.512  10.305  -0.817   1.218
 45639   4.149  12.047 -12.581  11.351  -0.822   1.343  45642   4.147  12.049 -14.734  11.445  -0.9
64   1.355  45645   4.145  12.050 -15.083  10.826  -0.987   1.283  45648   4.144  12.051 -14.506   1
0.656  -0.951   1.263  45651   4.142  12.053 -12.016   9.489  -0.788   1.126  45654   4.140  12.054
  -6.708   7.280  -0.443   0.864  45657   4.138  12.056  -4.883   6.909  -0.321   0.821  457 0   4.
137  12.057  -5.911   6.747  -0.383   0.802  457 3   4.135  12.059  -6.318   7.734  -0.415   0.920
 457 6   4.133  12.060  -7.904   7.736  -0.520   0.921  45710   4.132  12.062  -9.480   5.179  -0.6
24   0.617  45713   4.130  12.063  -9.727   4.427  -0.641   0.527  45716   4.128  12.065 -10.653
3.731  -0.702   0.451  45719   4.126  12.066 -10.935   2.274  -0.721   0.271

***** JOB DONE.
$WEO LPS

$$
$ASS IN TD2 OUT MT4
$EXE TPDUPC BS
```

053321
12/2/77 - 11/30/78